NBER WORKING PAPER SERIES

BRAZIL'S TROPICAL PLAN

Eliana A. Cardoso

Rudiger Dornbusch

Working Paper No. 2142

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
February 1987

NBER Working Paper #2142
February 1987

Brazil's Tropical Plan

ABSTRACT

This paper highlights the institutional features of the inflation process and contrasts two stabilization efforts in 1964-66 and in 1986.The inflation process in Brazil is highly institutional. It does not resemble hyperinflations where pricing and wage setting are geared to the exchange rate by the hour, making it possible to stop inflation by simply containing money creation and fixing the exchange rate.

The two stabilization programs demonstrate that an incomes policy is an essential ingredient to non-recessionary stabilization. But they also show that demand restraint is inevitable if disinflation is to be viable. The 1964 program was gradualist and two-handed, relying on the supply side on wage repression. The 1986 plan was a heterodox shock treatment centered around an uncompromising price freeze and paying insufficient attention to the need for fiscal restraint.

Eliana A. Cardoso
Fletcher School of Law
and Diplomacy
Tufts University
Medford, MA 02155

Rudiger Dornbusch
E52-357
MIT
Cambridge, MA 02139

December 1986

BRAZIL'S TROPICAL PLAN[1]

Eliana A. Cardoso and Rudiger Dornbusch[2]

On February 28th 1986, with inflation at 400 percent per year, Brazil embarked on her second major stabilization effort in twenty five years. Figure 1 shows the history of the Brazilian inflation. In the 5 years between 1959 and 1964, increasingly populist administrations carried inflation from 10 to 100 percent. By 1968 it was down to 20 percent, a level that persisted until the first oil shock, when inflation jumped to 40 percent. There it remained until 1979. In the 5 years between 1980 and 1985, the government failure to absorb the debt and oil shocks in a non-inflationary manner pushed inflation from 50 to 220 percent.[3]

The inflation process in Brazil is highly institutional. It does not resemble hyperinflations where pricing and wage setting are geared to the exchange rate by the hour, making it possible to stop inflation by simply containing money creation and fixing the exchange rate. The design of an appropriate stabilization mix for Brazil, therefore, needs to recognize backward-looking indexation of wages, bonds and rents. Both the 1964 and the current program, rather than focussing exclusively on demand-oriented

---

[1]We would like to thank Daniel Dantas, Stanley Fischer, Eustaquio Reis and Mario Henrique Simonsen for helpful discussion.

[2]The authors are Associate Professor at the Fletcher School of Law and Diplomacy, Tufts University and Professor of Economics, Massachusetts Institute of Technology.

[3]Statistical data is from Conjuntura Economica, Fundacao Getulio Vargas, various issues, Brasil: Programa Economico, Banco Central, several issues, and Goldsmith (1986). For references on stabilization programs in Brazil see Dornbusch and Simonsen (1987).

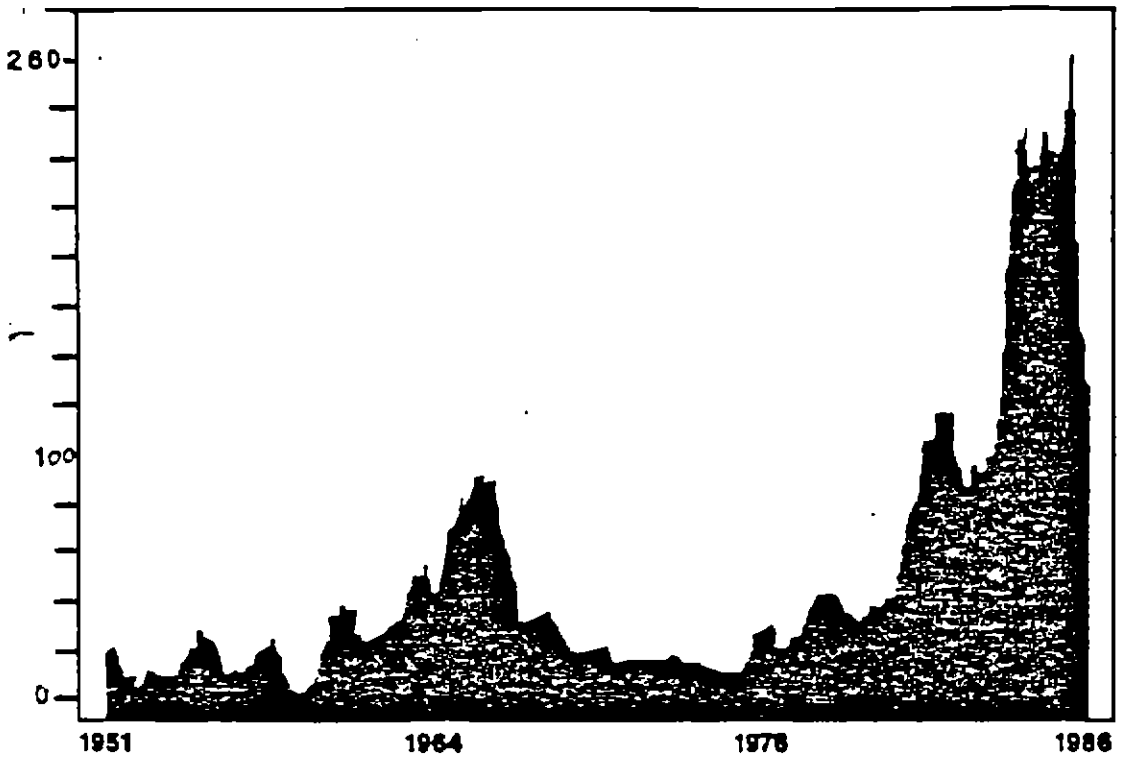

Figure 1: Brazilian Inflation
Percent Change over the last 12 months.
Source : Conjuntura Economica.

policies, enlist supply side measures to avoid the recessionary consequences typically associated with inflation fighting.

This paper highlights the institutional features of the inflation process and contrasts the two stabilization efforts. Brazilian inflation is best understood by recognizing the interaction of supply shocks and indexation as the main elements in generating acceleration. The two stabilization efforts demonstrate that an incomes policy is an essential ingredient to non-recessionary stabilization. But they also show that demand restraint is inevitable if disinflation is to be viable. The 1964 program was gradualist and two-handed, relying on the supply side on wage repression. The 1986 plan was a heterodox shock treatment centered around an uncompromising price freeze and paying insufficient attention to the need for fiscal restraint.

I. A Puzzle

Money expansion and velocity behavior are not enough to explain inflation dynamics in Brazil. There is little doubt that, from the demand side, large budget deficits in 1959-64 and in 1979-85 supported the inflation process. But assigning them more than an accommodating role would mean neglecting the important contribution of the supply side to inflation.

In high inflation economies, institutional arrangements provide for a periodical resetting of real wages to a peak. The peak real wage occurs at the date of the contract immediately after the nominal wage increase. Subsequently, up to the next adjustment the real wage is eroded by inflation. Figure 2 shows the actual real minimum wage in Brazil over the past 10 years. At fixed intervals the real wage increases to a peak and then

is eroded over the interval between adjustments, reaching a trough just prior to the next adjustment, a year or six months later.

Escalation of inflation to three or four digits invariably involves a shortening of adjustment periods for wage and price setting. This shortening of the adjustment interval increases inflation: in a context of overlapping contracts the shortening of the intervals means that a larger number of contracts are revised on the same date, pushing up costs and hence inflation.

In 1979, the annual adjustments of wages in Brazil were accelerated to a twice yearly base. This translated into a supply shock for firms and led to a doubling of the inflation process. Higher inflation in turn further shortened intervals pushing inflation up once more. By the end of 1985, firms and workers were begining to move into 3 months revision cycles. The governemnt was keenly aware that the transition to even shorter periods must have hyperinflationary consequences and hence tried to avoid the shortening of intervals.

It is important to make a distinction between the payments period, which is weekly or monthly, and the frequency of inflation adjustment. Wage adjustment for past inflation occurs at fixed intervals. In any inflation process, intervals shrink from several years to a year, 6 month, 3 month, 1 month and ultimately to the daily course of the dollar. These periodic adjustments are common to any inflation process and so is their gradual shortening.The pattern of adjusting intervals is a poorly understood aspect of the inflation process. The puzzle is why adjustment intervals show so much inertia.

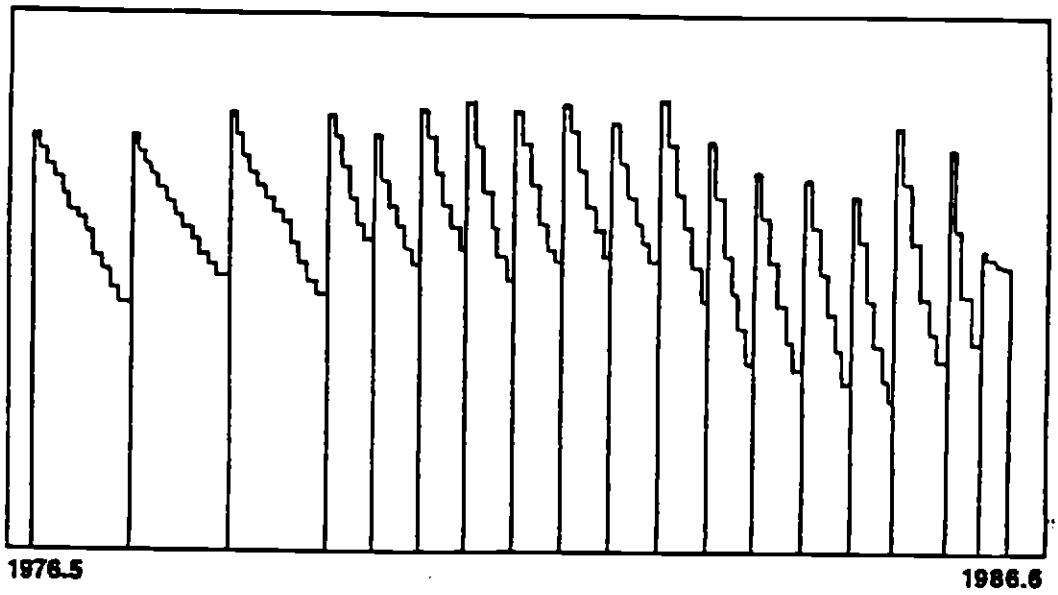

Figure 2: Minimum Real Wage
Monthly data.
Source : Conjuntura Economica.

The average real wage during the contract will depend on the rate of inflation and the length of the interval. Given the expected inflation rate, the same average real wage can be obtained by the combination of shorter intervals and lower real peaks or larger intervals and bigger peaks. If wage earners are unable to lend and borrow in perfect capital markets, they are forced to hold cash in order to sustain their consumption levels during the period when their real wages are below the real average. Cash held for later consumption has its purchasing power eroded by ongoing inflation. Wage earners who do not have access to perfect credit markets clearly should prefer an even flow of real wages rather than the tooth-saw pattern of Figure 2. They must be willing to trade smaller nominal wage increases for shorter periods of wage resetting.

In Brazil, adjustments intervals have shrunk from 30 months in the 1950s to 6 and 3 months in the 1980s. The costs associated with lagged inflation adjustments can be indicated by the number of months for which the real wage was below the real average during one interval multiplied by the ratio average/trough wage in the same interval. Figure 3 shows how higher costs associated with lagged inflation adjustments are related with higher real wages for the 37 adjustment periods of the minimum wage that occurred between 1954 and 1986 in Brazil. We do not understand however why intervals do not melt much more rapidly when inflation accelerates, in such a way that costs for wage earners associated with lagged adjustments would be smaller and roughly constant.

The costs of more frequent inflation adjustment of wages for firms are negligible. Adjustments of the pay period use resources, but not the revision of wages by some commonly public inflation index. Firms should be

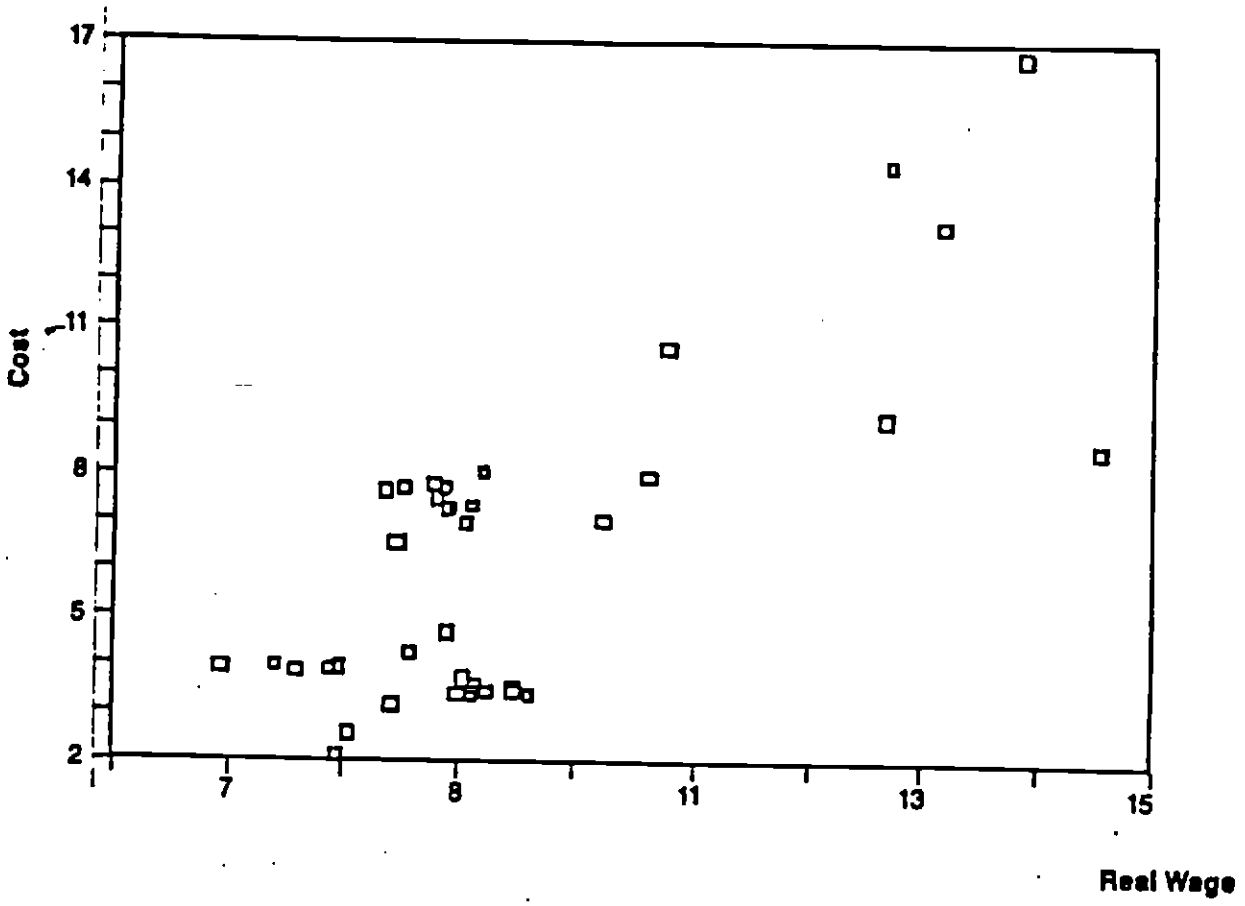

Figure 3: Average Real Wage and Cost of Lagged Wage Adjustment
37 contracts between July 1954 and June 1986.

willing to pay even wages equal in average to the discounted value of the tooth-saw pattern. Yet we only observe a shrinking of intervals when the inflationary erosion becomes extreme. Moreover, the transition often takes the form of an "advance" on the upcoming adjustment.

II. Other Institutional Aspects of Inflation

Fischer (1977) and Taylor (1979) have drawn attention to the persistence of price disturbances in a setting of overlapping longterm wage contracts even under forward looking, rational expectations behavior and a well-understood program of monetary control. In the Brazilian setting, institutional factors take, to a large extent, the room of relative wage and expectations mechanisms that characterize Fischer-Taylor contracts. Mandatory indexation is backward-looking and periodically readjusts wages and other contracts.

We express this inflation process in Eq.(1). Wage inflation, w_t, is shown equal to past price inflation plus a disturbance term. Ceteris paribus, current inflation, p_t, is equal to past inflation, via indexation of wages, the exchange rate and public sector prices. The output gap or unmeployment affects current inflation because it influences the marginal costs of firms to the extent that turnover of the labor force can be used for wage cutting. The third term, u_t, represents supply shocks. These are superimposed on indexation which propagates them.

$$(1) \qquad p_t = w_t + agap_t + u_t \quad ; \quad w_t = p_{t-1} + v_t$$

This inflation process has several implications. First, current supply shocks are automatically transmitted to future periods. An oil price increase, a real depreciation, increases in indirect taxes, elimination of public sector subsidies or increases in the real price of agricultural goods raise the current rate of inflation and are transmitted via indexation into increased inflation in subsequent periods. In fact, to raise real prices or cut real wages in the presence of full indexation, the frequency of adjustment of exchange rates and public sector prices has to be higher than the frequency of wage adjustments. Only then is it possible to beat the indexation, cutting the <u>average</u> real wage during the adjustment period by stepping up the rate of inflation. Indexation of the financial system, of the tax structure and of the public debt imply that changes in the inflation rate are automatically and fully accommodated.

Second, a slowdown in the growth rate of nominal spending cannot eliminate inflation from one day to the next. They run counter to the cost-inflation that comes from lagged inflation captured by the wage inflation term in (1). The neo-classical answer of instant recontracting of the labor force with reduced wage adjustments in the face of a shift to a non-inflationary monetary regime is implausible. The presence of inertia is thus one good reason for the use of incomes policy in a stabilization program.

Third, the inertia of the inflation process implies that contracts that are not explicitly indexed in a backward looking way, as for example shortterm loans in the financial system, carry forward looking inflation adjustments. At any point in time there is a given stock of such contracts outstanding. Their maturity may run as far as 6 months or a year. A sudden disinflation would imply an arbitrary redistribution between debtors and creditors.

Fourth, any escalation of inflation started off by some supply shock encounters further endogeneous elements that feed the inflation process. One is the increase in the velocity of money. Another one is the inflationary erosion of tax revenue which then implies increased rates of monetary expansion.

Finally, an important factor in accelerating inflation is the endogenous shortening of the interval for inflation adjustment of wages, public sector prices and the exchange rate.

III. Two Stabilizations

The main reason for the sharp increase in inflation between 1959 and 1962 was the fast increase in demand. Between 1957 and 1962, industrial output grew at 11 percent per year. The share of the Central Government budget deficit in output increased from 2.8 percent in 1960 to 4.3 percent in 1963, while the seignorage share in GDP widened from 3.6 percent in 1959 to 5.7 percent in 1962. The combination of a 30 percent deterioration of the terms of trade, the lack of external finance, a bad coffee crop in 1963 and adverse climatic conditions leading to an agriculture disaster in 1964 all contributed to the inflation problem.

The 1964-68 Stabilization: The economic crisis was the vehicle for a military take-over on March 1964. The Programa de Acao Economica do Governo (PAEG,1964/66) detailed a plan to reduce inflation gradually in 3 years using fiscal consolidation and incomes policy. The following were the main aspects of the program:

(a) Fiscal consolidation led to a gradual reduction in the deficit from 4.2 percent of GDP in 1963 to only 1 percent in 1966. The main instruments

of this budget balancing were increases in public sector prices, cuts in subsidies, increased tax collections obtained through an increase in indirect taxes and better administration to avoid tax evasion. Despite the initial increase in wages for the military and civil servants, and an increase in investment expenditures after 1965, the deficit was reduced. Later on, the reduction of real wages also helped the budget.

(b) The exchange rate was devalued by 70 percent at the outset of the program.

(c) Starting in 1965, the incomes policy took the form of granting wage increases not in line with past inflation, but rather geared to "expected inflation" which was announced to be declining.In terms of the inflation model of Eq.(1) the disinflation was achieved by breaking the link between current and past inflation: wage adjustments became forward-looking and limited to an officially imposed inflation forecast. The cut in wage inflation helped absorb the impact of public sector price increases and exchange depreciation. But the reduction in price inflation fell by a wide margin short of the anticipated decline built into wage agreements. The effect was to reduce real wages. The real minimum wage fell by 15 percent between 1964 and 1967. The wage cut made room both for budget balancing and for an improved external competitiveness while at the same time bankrolling a cut in the rate of inflation.

(d) On the price side, the government introduced a program of fiscal, credit and other incentives to firms which would accept a convenant not to raise prices by more than a stated percentage. Allowable cost increases excluded wage awards in excess of those contemplated in the government wage formula. In 1966, firms were promised a 20 percent reduction in excise taxes

if they carried out wage increases in accordance with the government wage formula. From 1967 on, price guidelines became more pervasive, falling on most large industrial firms.

(e) Monetary policy was erratic. An initial moderate expansion in 1964 was followed by a tightening in 1965-66. Indexation in financial markets was used to mobilize domestic saving and to create a market for public sector debt. The black market premium that had reached 60 percent in the last quarter of 1963, by the end of 1964 was already down to 4 percent and oscillated below 1 percent in 1965 and 1966.

The program was successful in reducing inflation without generating a dramatic decline in economic activity. Inflation declined from 144 percent in the first quarter of 1964 to 57 percent in 1965 and 38 percent in 1966. Industrial production declined in the first year of stabilization by 5 percent, but then showed a rapid recovery. By 1966 it was already 6 percent above the pre-crisis level.

In 1968 a new plan was adopted. First, a crawling peg exchange rate policy was introduced to depart from the pattern of real exchange rate swings associated with discontinuous devaluations. Second, credit became more abundant. Third, in response to public reaction against the squeeze the government revised the wage adjustment rule. The new wage formula corrected half-way the inflation underestimation. Real minimum wages continued to fall until 1970 and a new formula was created in 1974. Wage readjustment then returned to the pattern of backward looking catch-up indexation.

The 1965-68 reforms were the basis for an extended period of strong growth with stable inflation. Between 1968 and 1974 real growth averaged 10 percent per year and inflation declined to only 20 percent.

The 1986 Stabilization: The current stabilization set an end to an inflation that reached 400 percent per year in the first month of 1986. The inflation escalation that started with the second oil shock and the shortening of the intervals for wage setting accelerated with the large real depreciation in 1983, with an agricultural disaster, with correction of prices of the public sector and subsidies cuts. A major recession in 1983 cut the real wage, which neverthless started to recover in 1984. In 1985, the new democratic government embarked on a program of expansion that carried real growth to 8 percent (see Table 1). Another bad crop introduced supply shocks which, combined with the recovery, led to a shortening of the interval for inflation adjustment in some sectors of the private sector to only 3 months. Mindful of inflation acceleration and upcoming elections later in the year, the government embarked on a program of stabilization via incomes policy.

Table 1: Brazilian Macroeconomic Data, 1982-86

	1982	1983	1984	1985	1986[a]
Inflation[b]	98	142	197	227	60
Growth	0.9	-3.2	4.5	8.3	7.0
Budget Deficit[c]	16.7	19.9	22.2	27.1	9.9
Operational Deficit[c]	6.5	3.0	1.6	3.5	4.1
Current Account Deficit[c]	8.5	3.5	0	0.1	0.5
Interest Payments[c]	6.5	5.3	5.4	4.7	3.7

[a]Estimate; [b]Dec.-Dec.; [c]Percent of GDP
Source: Banco Central do Brasil

Plans for an inflation stabilization that circumvented the critical difficulty of inertia had been widely discussed in Brazil for more than a year and the Argentine and Israeli precedents were already on hand. The key steps of the Cruzado Plan were the following:

(a) Wages were readjusted and frozen. Contracts with several months to readjustment were rolled up and contracts that had experienced a recent readjustment were rolled back. As a sweetener, the minimum wage received a bonus of 15 percent increase over its past real average and other workers an 8 percent bonus.

(b) All prices and the exchange rate were frozen until further notice.

(c) A tablita was devised to eliminate the expected inflation built into extant contracts and thus avoid arbitrary redistribution between debtors and creditors. A new currency, the cruzado, was introduced to help facilitate the readjustment.

(d) Indexation which had been blamed for the acceleration of inflation was eliminated. For wages a escala movel with a 20 percent threshold was substituted. In financial markets indexation was maintained only for instruments of more than one year maturity.

(e) There was a sharp initial monetisation of the economy to avoid the Argentine problem of exceptionally high real interest rates. In the first three months following stabilization the monetary base doubled.

(f) On the fiscal side the tax reform of December 1985 was expected to have laid much of the groundwork for stabilization. The expected revenue gains were to close a budget deficit of 6 percent of GDP. Tax revenues rose disappointingly little due to two features of the approved tax bill: a lowered income-tax withholding schedule and an increased reliance on

taxation of financial assets no longer popular. Revenues of state-owned companies were hurt by the price freeze, spending ran higher than anticipated and subsidies that were cut during 1983-84 have since staged back. The public sector wage bill increased in line with the economy-wide trend.

(g) External factors favored the program in three respects. The decline in world interest rates reduced the debt sevice burdens in the budget and in the external balance. Sharply lower world oil prices made a major contribution in the same direction. Dollar depreciation in the early period of the program helped achieve a gain in competitiveness. Thus the program started off with a more than favorable development on the external balance side.

In terms of Eq.(1) the key point of the program was to eliminate catch-up inflation in the wage. This was done by the offsetting influences of rolling some contracts back and others up. Thus inertial inflation was simply suspended. But this time the real wage was increased. The cost was borne by a reduction in profit margins of price-controlled firms.

Between February and June, cumulative inflation was zero. Industrial production increased by 12 percent in the first half year of the program relative to the same period a year before.

Over the past 8 months the program has taken a life of its own. Fuelled by strong popular suppport for the price freeze Finance Minister Dilson Funaro elevated controls to a fetish. The budget was allowed to deteriorate dramatically, the trade surplus disappeared, shortages and black markets became pervasive. But "zero inflation" remained the ministerial obsession.

Minor adjustments in the program were necessary already in September. They went in the direction of very special excise taxes: so large that they were claimed to solve the budget problem, and so small that they could be eliminated from the official price index. Following a landslide election victory, a second round of such excise tax increases was imposed in November with the objective of raising 4 percent of GDP in revenue. Once again they were eliminated from the index. Clearly the government was trying to reenact the 1964 program of real wage cuts to restore the external balance and the budget. But the absence of any austerity and the restraints of a democratic regime put severe limits on the exercice.

By October, inflationary expectations were becoming extreme. The removal of long adjustment lags in wages, which previously had been an element of short-term stabilization, meant that inflation could accelerate dramatically. This possibility is reinforced by the escala movel which potentially put wage adjustments into the express lane.

Comparison: During the 1964 stabilization the preceding high inflation with no indexation had reduced the real value of the public debt to less than 4 percent of GDP. In the 1986 stabilization, by contrast, prevailing indexation and high real interest rates had left a debt-income ratio of foreign and domestic debt combined of 50 percent as a mortgage for stabilization. The large debt and insufficient budget improvement led to the expectation that the government might seek to reduce the debt burden by inflation soon pushed up nominal interest rates and the black market premium.

By the end of the year the freeze remained on, but the heat was on, too. The black market for dollars stood at a premium of more than 100 percent and even with official price stability the shortterm interest rate reached 150 percent. A dramatically clever program appeared to have been thrown into the wind.

IV. Issues and Lessons

The two Brazilian stabilization programs seen in conjunction teach a number of lessons. First, incomes policy is a valuable means in achieving disinflation. It helps avoid dramatic unemployment. But incomes policy by itself is not enough. Without fiscal consolidation the disinflation is not viable, with a boom it does not even last long. Moreover, disinflation has not been costless. In 1964 wage repression was the front payment for disinflation and in 1986 it was the redistribution from firms to workers implicit in the rise in real wages and the cut in profit margins, a loss in exchange reserves and a dererioration in competitiveness.

The second lesson concerns indexation. Indexation in the presence of supply shocks is a source of inflation propagation. But it also protects an inflation rate against rapid acceleration. An economy with long adjustment periods has an inflation process that is not rapidly expected to accelerate. Indexation of assets reinforces the element of stability. In the 1964 episode indexation was reinforced and broadened. In 1986, by contrast it was eliminated altogether and replaced by adjustment triggers without cap. The latter setting has led to a highly volatile atmosphere where inflationary expectations can easily become the driving mechanism for an actual inflation and where the absence of financial indexation drives asset holders to goods

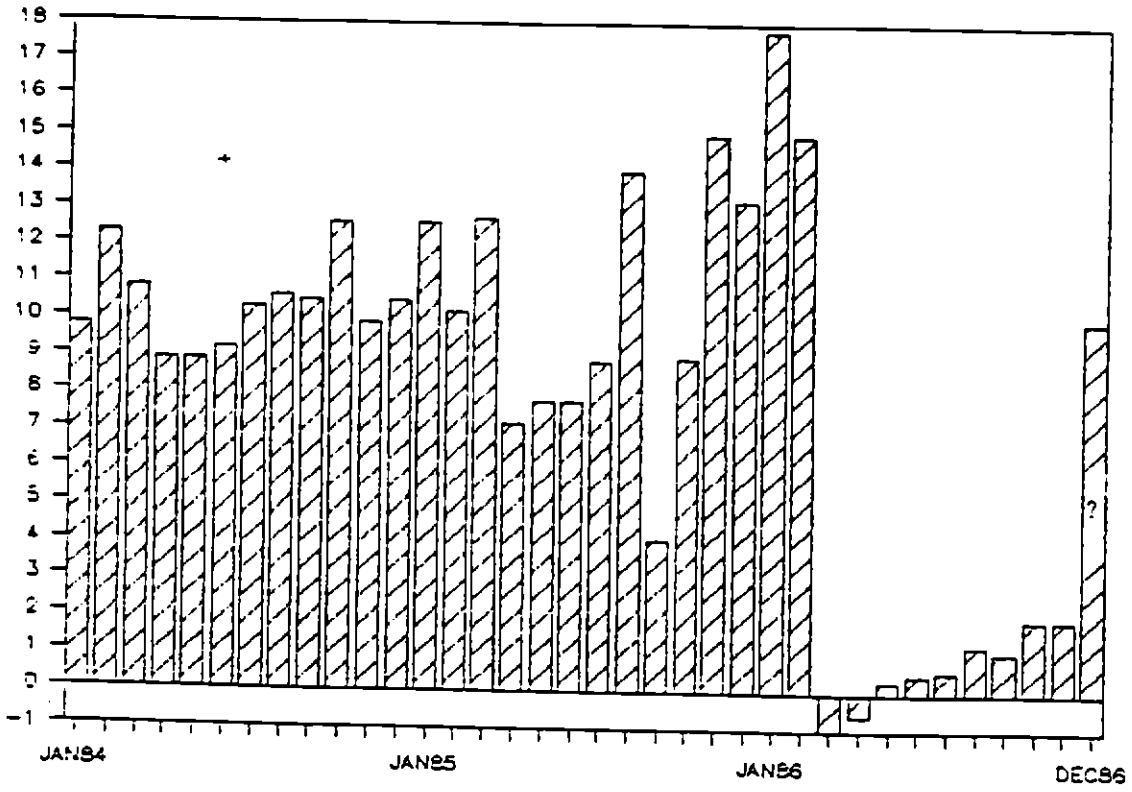

Figure 4: Monthly Inflation Rate
Source: Conjuntura Economica

and to the black market. Inflation now, contrary to the past twenty years, can quite possibly become self-generating. Figure 4 shows monthly inflation between January 1984 and December 1986. The sharp deceleration of inflation in mid 1986 was substituted by an explosion of prices in December. The lesson is that restoration of indexation in labor and asset markets, with long adjustment intervals, is good advice.

A third point concerns monetisation following disinflation. During the high inflation real money demand declines. When price stability breaks out the demand for real balances rises. The real interest rates turns sharply positive unless the government engages in a significant monetisation. But it is difficult to know what is enough. One criterion is the level of the real interest rate, the other the behavior of monetary aggregates. It is hard to judge the appropriate level of real balances because in the inflation period financial liberalisation will have taken place which at least partially destroys traditional linkages between interest rates and real balances. It is difficult to judge whether hysteresis is important here. But being too conservative is problematic because high real interest rates in the presence of a large public debt create a fiscal problem.

A final point concerns the budget. Must the budget be strictly zero, or even in surplus for monetary reform to succeed? Or is it possible to finance a small deficit in a noninflationary manner? To a large extent this depends on the growth rate of output, the prospective path of real tax revenues and the real rate of interest. If output growth is high and the real rate of interest is negligible, there is room for deficits. If the relation is the reverse substantial caution is needed because of the risk of

building up a fiscal problem which ultimately requires inflationary liquidation.

REFERENCES

Dornbusch, Rudiger and Mario Henrique Simonsen (1987), " Inflation Stabilization with Incomes Policy Support", Group of Thirty, New York.

Fischer, Stanley (1977), "Long Term Contracts , Rational Expectations, and the Optimal Money Supply Rule", Journal of Political Economy, pp.191-205.

Goldsmith, Raymond (1986), Brasil, 1850-1984: Desenvolvimento Financeiro sob um Seculo de Inflacao, Editora Harper & Row do Brasil.

Taylor ,John (1979), "Staggered Wage Setting in a Macro Model", American Economic Review (Papers and Proceedings), pp.108-113.

Brasil: Programa Economico, Banco Central, several issues.

Conjuntura Economica, Fundacao Getulio Vargas, several issues.